



The Dynamic Sun

A student activity sheet to accompany *The Dynamic Sun* version 4.0 (CD developed by the Solar and Heliospheric Observatory (SOHO)...a mission of international cooperation between NASA and the European Space Agency.) Special recognition to Steele W. Hill, SOHO Media Specialist at NASA's Goddard Space Flight Center, for the many hours logged into the construction and revision of this excellent learning tool!

Make no marks on this paper. Put all answers on a separate sheet.

Read through the instructions on Frame 1 to learn how to navigate through this program.

1. (Frame 4) How does our Sun compare in size to others in the universe?
2. What causes the Sun's uneven surface appearance?
3. Where in our Milky Way Galaxy is the greatest population of stars located?
4. (Frame 5) True-False: Ultraviolet light from the Sun is highly visible to us here on Earth.
5. Briefly synopsise how UV images are produced.
6. What is the speed of light in both metric and English units?
7. What is the entire range of light (energies) called that can and cannot be seen by the unaided eye?
8. From the diagram depicting waves of varying lengths, draw what appears to be the Greek symbol for wavelength.
9. From the electromagnetic spectrum diagram, estimate the wavelength (in meters) of visible light.
10. Gamma rays can be as short as _____ meters.
11. Can radio waves be as long as a football field?
12. (Frame 6) From the images in the clip, describe how the appearance of the Sun changes when viewed under different wavelengths of light.
13. (Frame 7) How many times faster does the earth rotate as compared to the Sun?
14. True-False: This video clip shows one complete rotation of the Sun on its axis.
15. (Frame 8) How many Earths can fit across the diameter of the Sun?
16. How many Earths can fit INSIDE the sun?
17. (Frame 9) What is the central-most section of the Sun called?
18. What zone occupies the top third of the Sun?
19. Describe the relative temperature of the plasma found in prominences as compared to that in the rest of the Sun.
20. What do we call the brief, intense explosions that blast radiation and energized particles away from the Sun?
21. The visible surface of the Sun is called the _____.
22. Temperatures in the core of the Sun can reach _____ °.
23. Compare the temperature of sunspots to the surface temperature of the Sun.
24. What layer of the Sun is found between the photosphere and the corona?
25. (Frame 10) What is the most prominent element found in the Sun?
26. About how far is the Sun through its life cycle?
27. In one MINUTE the Sun produces enough energy to supply the U.S.'s energy needs for how many years?
28. (Frame 11) If you drove at **200** mph, how long would it take to get to the Sun?

29. (Frame 12) What type of energy field seems to be associated with sunspots?
30. True or False: A sunspot may not exist for even one rotation of the Sun?
31. Are sunspots ever larger in size than the Earth?
32. How much COOLER are sunspots as compared to the surrounding surface of the Sun?
33. (Frame 13) What has to happen to magnetic field lines before heat and solar blasts of supercharged particles are released?
34. (Frame 14) In what year(s) was the last “solar minimum” (low sunspot activity?)
35. How many times longer or shorter is the solar magnetic cycle as compared to the solar sunspot activity cycle?
36. (Frame 15) Compare the solar activity in June 1999 to that of December of 1996.
37. (Frame 16) If an X-ray image of the Sun were to show a prominent corona, would this indicate a period of high or low solar activity?
38. What country is responsible for these X-ray images of the Sun?
39. (Frame 17) The production of what type of atoms in a fusion reaction within the core of the Sun results in the release of energy?
40. How long does it take the protons and their associated energy produced in the core to reach the surface of the Sun?
41. (Frame 18) Describe the movement of gases in the convection zone of the Sun.
42. (Frame 19) How many TIMES hotter is the corona as compared to the surface of the Sun?
43. (Frame 20) From the video clip, estimate the diameter (in arc seconds) of a typically LARGE granule found on the surface of the sun.
44. (Frame 21) True-False: Audible sound waves are actually produced by the Sun which can be heard here on Earth if one listens carefully in an extremely quiet surrounding.
45. (Frame 22) From what SPECIFIC region of the Sun does the solar wind originate?
46. (Frame 23) In how many different modes do magnetic field lines exist on the Sun?
47. (Frame 24) What happens to most of the Sun’s magnetic field lines?
48. (Frame 25) What seems to guide the movement of the gases in a solar prominence?
49. True- False: The gases in a prominence seem to remain suspended above the photosphere.
50. (Frame 26) Estimate the height of the loop (in Earth diameters) in the upper left of the screen.
51. (Frame 27) Is the temperature of the plasma 100,000 km above the Sun hotter or cooler than the surface temperature?
52. (Frame 28) Offer an explanation as to why the solar prominence assumes the shape of a “loop” in the video clip.
53. (Frame 29) Why was SOHO able to capture the image of Mercury, Venus, Jupiter and Saturn (being so close to the Sun) while it would have been impossible to see them from Earth?
54. (Frame 31) In studying comets, why did scientists believe there must be a radiation pressure (solar wind)?
55. How many “tails” does a comet have?
56. (Frame 32) What percentage of the comets discovered by SOHO have been sun-grazers?
57. (Frame 33) True-False: Coronal mass ejections (CME’s) seem to emanate in only one direction from the Sun. (See video clip.)
58. (Frame 34) Approximately how many CME’s were discharged during this 16-day video sequence of the Sun’s activity?
59. (Frame 35) What is producing the “snowstorm” effect after the production of the CME in this video clip?
60. (Frame 36) Compare the intensity of a solar flare explosion to that of a CME.
61. (Frame 37) From the information given, how far from Earth must the SOHO spacecraft be located?
62. True-False: It takes 2-5 days for the ejected protons of a CME to reach SOHO.
63. (Frame 39) From the video clip, where do the charged particles of the CME appear to enter the Earth’s atmosphere/magnetosphere?
64. (Frame 40) What TWO effects does a CME have on the shape of Earth’s magnetosphere?

65. (Frame 41) Is it easier to view the northern and southern lights from the equator or the Arctic and Antarctic Circles?
66. True –False: The northern and southern lights are caused by fast moving, positively-charged particles entering the Earth’s magnetosphere.
67. (Frame 42) Name at least three colors in which the auroras may appear.
68. (Frame 43) From THIS video clip of auroral activity, did Mexico ever get to view these northern lights?
69. (Frame 44) What probably is the spike-like object extending horizontally from left-to-right in this photo?
70. (Frame 45) Is it possible that the northern and southern lights can appear simultaneously?
71. In March of 1989, did the intensity of the solar storm appear to move eastward or westward?
72. (Frame 48) Exposure to what TWO types of radiation can cause astronauts to become severely ill or even die?
73. What would be the effect on satellites in orbit when CME’s cause the atmospheric gases to heat and expand?
74. What types of communication can be affected by CME’s?
75. (Frame 49) Describe a specific instance in which reduced solar activity resulted in a significant cooling effect here on Earth.
76. According to the graphed data, how does the length of sunspot cycles affect the global temperature here on Earth?
77. (Frame 50) Describe the level of health risk to humans as a result of CME’s.
78. (Frame 51) The SOHO mission is a joint effort of what two agencies?
79. For how long has SOHO been in space?
80. How many years passed between the beginning of the planning stages and the launch of SOHO?
81. (Frame 52) What is the name of the most sophisticated solar observatory ever launched?
82. True-False: There are both a slow and a fast solar wind.
83. (Frame 53) After viewing the video clip accessible on the right of the screen, describe the position of SOHO (in relation to the Earth and the Sun) as we orbit the Sun.
84. How many Earth-years are represented by the duration of this video clip?
85. Is SOHO in orbit around the Sun or the Earth?
86. (Frame 54) What solar-probing spacecraft (in addition to SOHO) is orbiting at a considerably large distance from Earth?
87. (Frame 55) What major advantage does SOHO have over the four land-based solar observatories shown on this page?
88. (Frame 58) What future NASA mission will concentrate on the subject of solar flares?
89. What NASA mission getting its acronym from the term “Solar Terrestrial Relations Observatory” will focus on CME’s using two spacecraft collecting data from different points in space?
90. What program slated for 2008-2016 will include several coordinated missions which will study and monitor the Sun-Earth connection?
91. (Frame 59) What safety tip is given regarding looking directly at the Sun?